



## **Pre-Mac – Model PWP Water Purifier**

[www.pre-mac.com](http://www.pre-mac.com)

### **Device Information**

The Pre-Mac model PWP water purifier is a pour-through portable water treatment device operating by gravity flow. According to the manufacturer, microbiological treatment consists of filtration and disinfection. The device consists of a cap to use for collecting untreated water, a pre-filter chamber to pour the untreated water into, the flow-through treatment chamber containing activated charcoal cloth and iodine resin, and a water bottle adaptor to connect the PWP directly to a bottle for receiving treated water. Untreated water collected with the top cap is poured into the pre-filter chamber where coarse filtration is provided by a cleanable filter pad and a fine mesh screen. The water then flows through the treatment chamber where the activated charcoal cloth provides filtration and adsorption, followed by disinfection provided by the iodine resin. The resin is designed to impart an iodine residual (typically 3-5 mg/L) in treated water that provides additional disinfection. The manufacturer directs users to provide a minimum of 2 minutes contact time before drinking. An optional outlet filter can be used to remove residual iodine, but specifics of this filter are not known. The manufacturer also offers an optional field test kit for measuring iodine residual in treated water. The device should be stored in an upright position at normal room temperature. Avoid repeated freeze-thaw cycles.

### **Effectiveness Against Microbial Pathogens**

No test data is available for the model PWP water purifier using the U.S. Environmental Protection Agency (USEPA) Guide Standard and Protocol for Testing Microbiological Water Purifiers (reference 1). However, an independent laboratory conducted testing using the USEPA Protocol on an earlier Pre-Mac model water purifier that is very similar in treatment technology (reference 2). Therefore, these results are considered applicable to the model PWP water purifier. The results showed the earlier model consistently met the 6-log and 4-log bacteria and virus removal/inactivation minimum requirements. The device did not consistently meet the minimum 3-log protozoan cyst removal/inactivation requirement when challenged with *Cryptosporidium* oocysts. These test results suggest the Pre-Mac PWP would meet the minimum 6-log bacteria and 4-log virus removal/inactivation requirements when used according to directions. The results also suggest the Pre-Mac PWP would not meet the required minimum 3-log cyst removal/inactivation for *Cryptosporidium* oocysts. Independent testing using a protocol other than the USEPA Protocol verifies the ability of the Pre-Mac PWP to consistently provide at least a 6-log bacteria removal/inactivation. Independent testing of other Pre-Mac models (SWP and MWP) using a non-USEPA protocol suggest the PWP will consistently

provide a 4-log virus removal/inactivation. Available testing data did not include *Giardia* cysts as a test organism. Based on general knowledge of the treatment technologies used in the PWP water purifier (activated carbon and iodine resin), the device would not consistently provide a 3-log removal or inactivation of *Giardia* cysts when used as directed. If the iodine resin is a pentaiodide (I<sub>5</sub>) resin, the device would be capable of reducing *Giardia* cysts if contact time after passage through the device were extended to at least 40 minutes (reference 3). However, since there is no device-specific testing data available using *Giardia* cysts and we do not know the exact composition of the iodine resin, we must consider the device ineffective against *Giardia* cysts. Additional treatment is, therefore, necessary to remove or inactivate cysts. Based on evaluation of available data and considering the data did not include device-specific testing using the USEPA protocol, the Pre-Mac model PWP water purifier receives one √ for bacteria, and viruses, and one X for *Giardia* cysts and *Cryptosporidium* oocysts (for an explanation of the rating checks [click here](#)). The following table summarizes the device's expected effectiveness against microbial pathogens, evaluation rating, and the mechanism by which pathogens are removed or inactivated:

**Table. Expected Performance Against Microbial Pathogens.**

Microbial Pathogen Type	Expected Performance	Evaluation Rating	Inactivation/removal Mechanism
Bacteria	> 6-log	√	Iodine disinfection with some size exclusion and adsorption
Viruses	> 4-log	√	Iodine disinfection with some adsorption
<i>Giardia</i> cysts	Not Effective	<b>X</b>	Some size exclusion, adsorption and iodine disinfection
<i>Cryptosporidium</i> oocysts	Not Effective	<b>X</b>	Some size exclusion and adsorption

#### Production Rate and Capacity

The stated capacity is 1000L. Inherent to the production rate and capacity of filtration devices is the quality of the raw water source. The actual production rate and capacity is dependent on the raw water quality. The manufacturer's stated production rate is 200 ml/min.



### Cleaning, Replacement, End of Life Indicator

When flow through the device becomes very slow, stops, or 1000L of water has been treated, the device must be disposed. The device is not capable of being cleaned or backwashed. Instructions recommend discarding the first 0.5L of treated water if the PWP water purifier is new.

### Weight and Size

The dry weight of the device is 500 grams. Dimensions are 9.5 cm diameter x 14 cm length.

### Cost

The Pre-Mac PWP water purifier is not sold at stores in the United States. The device is available through online ordering and at stores outside of the United States. The device costs approximately \$100.

### Device Evaluation

Based on evaluation of available data, the Pre-Mac model PWP water purifier is expected to consistently provide 6-log bacteria and 4-log virus removal or inactivation under most water quality conditions expected. The PWP water purifier will not consistently provide a 3-log *Giardia* cyst and *Cryptosporidium* oocyst removal or inactivation. Additional treatment such as filtration with a 1 µm absolute filter will be necessary to remove these protozoan cysts. Iodine resin disinfection is the primary mechanism of bacteria and virus inactivation. The iodine resin inactivates bacteria, viruses, and some *Giardia* cysts through direct contact with the resin as well as through the iodine residual the resin imparts to the water. The device will also provide some filtration and adsorption of bacteria, viruses, *Giardia* cysts, and *Cryptosporidium* oocysts due to the activated charcoal cloth. There is no indicator of process failure on a real-time basis and end of device useful life is based on filter clogging, or by the user keeping track of the volume of water purified. The iodine resin releases decreasing amounts of iodine as usage continues, but there are no instructions on when to dispose of the device based on iodine residuals if measured using the optional field test kit. Inherent to treatment devices using filtration is the likelihood of clogging and reduced device capacity when treating highly turbid water. The iodine resin and residual are not expected to cause any adverse health effects to healthy adults who have no pre-existing thyroid conditions or sensitivity to iodine. This device is not recommended for use by pregnant women (concern for fetus), people with known hypersensitivity to iodine, people with a history (or family history) of thyroid disease, and people from areas with chronic iodine deficiency (reference 3). The iodine residual imparted by the resin can cause a medicinal taste



and color the water. Iodine can be neutralized by adding ascorbic acid (Vitamin C) or sodium thiosulfate, which will improve the taste and color. Flavored drink mixes can mask the flavor. However, neutralizers and flavor aids should not be added until after achieving the manufacturer-directed contact time. The manufacturer also provides an optional post filter to remove residual iodine after achieving directed contact time.

### Advantages

- Independent testing using the USEPA protocol with a similar Pre-Mac device suggests the PWP water purifier will provide 6-log bacteria and 4-log virus removal or inactivation when treating most water quality conditions expected.
- Small and lightweight.
- Very easy to use.
- No adverse health effects expected in healthy adults with no iodine sensitivity.

### Disadvantages

- Not effective against *Giardia* and *Cryptosporidium*. Additional treatment is necessary.
- Not recommended for use by pregnant women or people with iodine sensitivity
- Can impart color and medicinal taste.

### References

1. U.S. Environmental Protection Agency, Registration Division Office of Pesticide Program, Criteria and Standards Division Office of Drinking Water. (1987). *Guide Standard and Protocol for Testing Microbiological Water Purifiers*. Washington, D.C.
2. U.S. Army Biomedical Research & Development Laboratory. (1993). *Evaluation of the Medical Efficacy of the Pre-Mac Model FWP Individual Water Purifier for Treating Microbiological Contaminants in Water*. (USABRDL Technical Report 9204). Frederick, MD. Prepared by Shaub, S.A., Hargett, H.T., Sterling, C.R., and Marshall, M.M.
3. U.S. Army Center for Health Promotion and Preventive Medicine. (2005). *Technical Information Paper; Iodine Disinfection in the Use of Individual Water Purification Devices*, Aberdeen Proving Ground, MD.

